AN ASCW MEMORANDUM

POST-WAR PLANS FOR SCIENCE

Three very important documents have been published recently which vitally concern every scientific worker. These are: 1. "Scientific Research and the Universities in Post War Britain,"* a statement by the Parliamentary and Scientific Committee. 2. "A National Policy for Industry"† signed by 120 Industrialists. 3. Industry and Research,"‡ the report of the Federation of British Industries, Industrial Research Committee. These documents are complementary and could conveniently be examined together but the first, from now on referred to as "the Statement," will be treated to some extent separately from the other two, referred to as "the Policy" and "the Report" respectively.

UNIVERSITY RESEARCH AND THE STATE

The Statement deals in general terms with the improvements in the organisation and finance of scientific research which will be necessary if Britain is to maintain her standard of living and her position in the post-war world. Many of the suggestions seem obvious to the scientist but they will be by no means obvious, nor even welcome, to the public at large, or to that special section of the lay public which constitutes the majority of the Houses of Parliament. The Statement opens with a discussion of the need for increased research. It points out that the mere maintenance of a reasonable standard of living is dependent on the most efficient use of our technological resources firmly based on the foundation of scientific discovery. Scientific research has passed out of the stage of the "cottage industry" operated by isolated individuals with rudimentary equipment and it now demands a high level of capitalisation and organisation. In Britain, expenditure in the universities and university colleges in 1938/9 was £6.7 million and the total research expenditure was certainly not greater than £7 million. The U.S.A. with a population three times as great spent in 1935-6 at least ten times these sums under these

To scientists the rapid relative advance of research both in the S.S.R. has long been apparent, and it is widely realised that e cumulative, and, but for the war, would have resulted in a the time that the results of such scientific investment had begun s fully apparent, probably about 1950.

erations apply to fundamental research, which has a value for ome ways to the establishment of first-class stocks of materials ry. Without stocks adequate both in quantity and quality the maintained: without a store of fundamental knowledge, not mediate use, applied science lacks an essential backing and comes sterile. The recognition of this important fact by those erience of scientific work is one of the essential pre-requisites of id the statement rightly comments with approval on the recent House of Lords by Lord Cherwell "that it is the policy and Government to increase their assistance to pure research" and that

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he would "welcome any developments in industry in a similar direction." At this point the Statement might well have gone further and stressed the extraordinary lack in Britain of appointments in fundamental research. Apart from a few appointments under such bodies as the Royal Society and the Royal College of Surgeons there are no posts of the first grade outside industry and government service which do not entail teaching duties.

THE BODIES CONTROLLING RESEARCH.

Continuing this same theme, the Statement notes with approval the work of the Agricultural and Medical Research Councils, and urges their further expansion—special care being taken to avoid regimentation (as distinct of course from planning) which might hamper progress. In the case of the former body it tempers its approval with the very relevant remark that "although our agricultural research workers have made discoveries of great value, we have failed until recently to be active enough in bringing the results of such research on to our farms or into our practice of husbandry." It has frequently been pointed out that the structure of our farming industry is such as to make it difficult for the small, under-capitalised farm to take advantage of scientific advances, and that many features of the financial arrangements designed to assist agriculture have in fact had the effect of enabling the inefficient and backward farmers to maintain their position at the expense of the community.

Turning to industrial research, the Statement praises the system of Research Associations fostered by the Department of Scientific and Industrial Research, but its quotation (without verbal comment) of the expenditure by the Department under this heading of less than £700,000 for 1942/43 is sufficient to arouse doubts of the adequacy of this budget as compared with the large budgets of science in other countries. However, the realisation of the need for progress is becoming more widespread. The Institution of Electrical Engineers is planning a British Electrical Research Board; there are similar proposals by the British Institution of Radio Engineers and the Gas Research Board. The Report of the Federation of British Industries is considered later; a study of future developments is being undertaken under the auspices of Manchester University; the Parliamentary and Scientific Committee has issued a report on research and the utilisation of coal. In this last field developments have already taken place, for the coal owners have indicated their intention of spending a fairly considerable additional sum (almost half a million pounds) on research purposes up to the end of 1945.

THE SUPPLY OF SCIENTIFIC WORKERS.

The increased demand for scientific personnel in the post-war world is an urgent problem. To ensure the best use of existing resources, workers now engaged on war research must be assisted into industry, with, if necessary, a period of fundamental training at the universities, or facilities for learning the special needs of the industry into which they are going, while those in the forces must be given, on demobilisation, a high priority for further education. It is to be hoped not only that the new committee under Lord Hankey will plan a solution to this vast problem but that adequate funds will be provided for carrying it out, and for implementing the somewhat vague statements which have appeared on the provision of training grants and other facilities on demobilisation.

To provide new resources of scientific personnel it is evident that the wartime schemes of training will need to be continued in the peace. In 1938-9 there were fewer that 13,000 full-time science and technology students in the country, to which must be added 1000 studying agriculture, and 13,600 medicine and dentistry. The statement contemplates a two or threefold increase in the number of science and technology students, a change which will entail not only the expansion of existing universities up to the desirable maximum student population of 5,000, the foundation of new universities and the provision of extra teaching staff, but also the provision of adequate financial support for the student sufficient 'to enable the holder to take a full part in the life of the university."

The phrase can be interpreted only as meaning the provision of adequate assistance at all stages of training. For the undergraduate it will mean the continuation of the system of state bursaries, with modifications and improvements suited to the wider and deeper studies needed in the post-war world. At later much improved facilities must be provided for post-graduate training,

supplemented by provision for post-doctorate work. The old system, by which the post-graduate students begged from grant-giving bodies until enough had been accumulated—usually from several different sources—was never calculated to produce the best results.

Even after his formal education is complete, the scientist must keep abreast of the latest developments in his own and related fields. To meet this need the Statement suggests the provision of refresher courses, and of special advanced courses arranged under university auspices and given by specialists from industrial and government laboratories.

IMPROVEMENT IN STATUS NEEDED.

It is clear that in this programme of expansion the universities and their teaching staffs have an essential part to play, and the Statement points out the necessity by quoting figures which show that in 1937 the average salary of a thirty year old university teacher outside Oxford and Cambridge was £313. This compares badly with the figure for the secondary school teacher of £354, and that for the Civil Service scientist of £400, although even the latter was paid at only about two-thirds the rate of the corresponding administrative grade. Such meagre scales of payment defeat themselves, since the university teacher is often compelled to divert a considerable part of his attention, at his most productive period, away from research to more lucrative occupations such as coaching and marking examination papers.

To increase the size of the universities and to raise the status of their staffs will demand adequate finance. The present direct government grant is £2¼ million per annum, to which must be added about another million from government departments and local authorities. The statement estimates that the government grant will need to be increased to something like £6 or £7 million per annum, and that in addition a total capital sum of £10 million will need to be provided for the first five post-war years.

Then follows a discussion of the administrative reforms which such an expansion would necessitate, the Statement noting that "We regard it as vital to preserve the present freedom which the universities enjoy from control by the Board of Education or other Government Departments." However, it does go on to suggest that the universities should establish an advisory council in order to make the best use of the new facilities, and to ensure full co-operation with industry. The nucleus of such a council already exists in the unofficial committee of the Vice-Chancellors, which might be extended to include representatives of the teaching staffs, and persons of distinction from industry, government service, and other fields concerned. To ensure an executive body of workable size it is suggested that from this extended committee a smaller executive council should be formed.

Lastly the Statement turns to a discussion of the problem of the introduction of a higher minimum of science into all courses in schools and colleges. It lays stress on the Norwood Committee's statements that "Natural science should find a place in the education of all pupils;" "for the first stage the course in all schools and for all pupils should consist of a general approach to the main fields of Natural Science;" "Degree courses comprising several subjects of Natural Science should become more common and be more commonly taken in universities in order to increase the number of teachers."

LABORATORY TECHNICIANS.

Besides the broad interest which this problem will arouse, there is a further problem of special interest to the members of the scientific profession. It concerns the training of laboratory assistants and technicians who are as indispensable to the progress and application of science as the research workers. The statement gives an illuminating quotation from a report made in 1916 by the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research:—"Without the scientific rank and file it will be as impossible to staff the industrial research laboratories which are coming as to fight a European war with seven divisions." The problem of training these workers is a matter which is closely bound up with the development of technical education in this country. The Statement very properly commends the pre-war scheme for the expansion of technical education which was to cost £12 million, and then urges an even greater

expansion than that originally proposed. Far more technicians will be needed than at present and their knowledge must be deeper. The quality of education given is closely related to the status and remuneration of the technicians' profession. The Statement remarks that "the amount of natural ability in search of training is very great," and that "we need to produce the men who have a fundamental understanding of processes as well as those who know how to work the levers and supervise the repairs." What is envisaged is the injection of scientific knowledge into all fields of technical education, a process which will involve changes and reform at all stages. For example it must be a condition of employment of the young technical assistant that he should be given adequate time off for training: that the courses, in this case perhaps in laboratory arts, should be suited to his needs. It is necessary that the buildings and equipment which have been the centres of work of inestimable value in wartime should be so improved as to be able to play their proper role as centres of technology. Even more important is the suggestion for the conversion of some of our technical colleges into Institutes of Technology on the American pattern, with full-time work and chairs, including the much needed ones of aeronautics and radio engineering.

This precis of the Statement can hardly end better than by repeating from it Professor A. V. Hill's words "Let us aim high in these matters from the start. Let us aim to double or treble the number of students who are given a higher education in science and technology; let us raise the standard of entry, by accepting only the best students regardless of private means; let us raise the quality of their education by improvement of accommodation, equipment and teaching. The final result may then be the five-to-ten-fold improvement and increase of scientific and technical education which the technical needs of our future will require."

THE INDUSTRIALISTS' POINT OF VIEW.

"120 Industrialists" who represent a wide range of British manufacturing industry but "make no claim to speak for anyone but themselves," have recently put forward their views and recommendations as to the future place of industry in society. The signatories believe that Industry is the largest contributor to the life of the nation and that it has a threefold public responsibility; "to the public which consumes its products, to the public which it employs, and to the public which provides the capital by which it operates and develops." They believe that Industry can be organised internally and in relation to the State so that this idea of service to the community can be more fully carried into effect without any changes in the social system. This fundamental belief in the desirability of private ownership of industry underlies the whole of the document.

As scientific research is not discussed and technical development is only touched on, there is little of direct scientific professional interest in the Policy. There is, however, a great deal to interest the scientific worker in his position of employee in industry and as citizen. There is a whole section devoted to the obligations of employers towards labour. The conclusions reached and recommendations made are apparently progressive and enlightened—Trade Unions should be recognized, Works Councils and Production Committees should be generally established, a minimum basic wage, holidays with pay, etc., provided. Unfortunately, one must assume from the absence anywhere in the Policy of a reference to the position of scientific employees that relations between management and scientific workers have not been considered. Presumably they are looked upon as "part of the management," but this is not stated; a statement by the signatories on this subject would have been of the greatest interest.

CENTRAL COUNCIL FOR INDUSTRY.

Probably the most significant part of the Policy is that concerned with the closer organisation of Industry in order "to assure to the consumer the fullest benefit of constant technical progress reflected in higher quality or lower prices or both, while at the same time establishing greater economic security for all than heretofore." This is a restatement of one of the three fundamental "responsibilities"—that to the consumer. Here it appears that the signatories are steering a rather tricky course between the Scylla of nineteenth century individualism and

liberalism and the Charybdis of a Corporate State. They advocate the creation of Sectional Associations for the various branches of Industry. The Central Council would have a number of functions, among them that of maintaining contact with the T.U.C., acting on behalf of British Industry on international questions, and that of making recommendations to the Government regarding industrial and social legislation.

It is impossible here to go into the details of the structure proposed, but in some respects it is very reminiscent of the "Corporations" structure of the late Italian Fascist State. The 120 Industrialists are probably aware of this for they say: "It is a cardinal point in our proposals that ample provision should be made for the protection of the public as consumer. We are fully alive to the fact that any proposals for the re-organisation of productive Industry, especially if they visualise the possibility of its being granted compulsory powers would, in the absence of such an assurance, be open to the criticism that it was an attempt on Industry's part to assume dictatorial powers. A study of this document should make it clear that nothing is further from our intentions."

According to the weight one attaches to such an assurance so one can view the proposals as reasonable measures of rationalisation or as dangerous moves towards a British Corporate Fascist system. It can fairly be argued that since such an enormous potential danger is inherent in the proposals it would be foolish to accept a mere assurance of good intentions. We need an organisation of the community to ensure that the good intentions are inevitably carried out.

INDUSTRIAL RESEARCH PAYS GOOD DIVIDENDS.

A view of research in industry is given in considerable detail in the F.B.I. Report which fits snugly into the general views of the 120 Industrialists; Lord Melchett (I.C.I.), indeed, signs both documents. This Report contains proposals which may influence the lives of all members of the AScW. We ought to be very clear about all its implications and the ways in which they concern our policy.

The F.B.I. Report recognises the importance of industrial research and development in the national economy and that in the future these will have an even greater part to play: "While every industry and firm does not provide an equal opportunity for the application of research, no industry can maintain progress without it" (para. 10.).

The Report considers expenditure on the finance of research to be in all ways inadequate: "The amount spent by industrial firms on research and development and by Research Associations on research represents a fraction of one per cent. of the value of industrial production" (Summary, page 21, para. 5.). "We are of the opinion that if one per cent of the total value of our industrial production were expended on research and development, involving the provision of personnel and facilities, the resulting increased productive efficiency and employment capacity would yield an annual return of many times such expenditure." (9, para. 20.).

Recommendations of this order were, of course, made as long ago as 1937 by the Parliamentary Science Committee (now Parliamentary and Scientific Committee) on the basis of a Memorandum prepared by the AScW (published in *The Scientific Worker*, Vol. X: No. 4. Nov-Dec. 1938; see also J. D. Bernal: *The Social Function of Science* (London 1939, Routledge) pages 429-440). The F.B.I. Report makes a number of Recommendations, of which one is "that every manufacturing firm should ensure that it is devoting to science and development the maximum effort and funds commensurate with the nature of its problems and, wherever possible, should maintain its own research department . . . . ."

This suggestion is no doubt on the surface admirable. But without co-ordination of research in an industry it can lead only to more intense competition, with all the usual secrecies, overlapping, etc. It will not by any means ensure that the community will benefit, but only that certain firms may be able to compete better with their trade rivals. This may lead to much 'research' directed to getting round patents, etc., which will not necessarily produce any socially advantageous results.

CO-OPERATIVE INDUSTRIAL RESEARCH.

The Report suggests that some types of problem, particularly these of general interest to an industry, can best be dealt with through co-operative machinery

such as the Research Associations. Firms within the industries which have their own collective research associations "should give the most careful consideration now to the question whether they are making to their research association a contribution, either in money or in other ways, commensurate with the work which, if adequately supported, it could perform in furthering the interests of the industry as a whole." (13, para. 29.).

The Report suggests that further "co-operative research committees should be set up in every industry which has not created a collective research association" and steps should be taken "to create and maintain a research fund which would equitably distribute the burden over the constituent concerns in proportion to their nterest in the industry." This means, of course, that in any industry where one or more firms had a predominating "interest", that interest would necessarily shape the research programme of the Association as a whole. The Committee thus set up, for the industry, would decide whether a research association should be established, "whether a link could satisfactorily be formed with existing research associations,or whether research problems could be dealt with extra-murally through university laboratories and other research establishments." Thus quite clearly a firm or group of firms with a predominating interest in any industry could control university and other "extra-mural" research.

All this general recognition of the need for more finance for research and development and for extending the organisation of research in the ways outlined is commendable; rationalisation, and even the development of monopolies can have potentially progressive aspects. But nowhere in the document is any practical suggestion made whereby the consumers or the State should take a share in deciding whether certain work should be undertaken because the community requires it. Everything is conceived from the angle of making "Industry" and individual firms more effective profit-making organisations; there is no conception of production for use. It is easy to see how the above suggestion for the further financing of research would in fact lead to the fields and directions of scientific research and development being controlled by the needs of commercial competition, which might be very different from the needs of the community.

THE DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.

With respect to the D.S.I.R. the Report recommends that the Department should "make maximum use of the wide powers it possesses both as regards the amount of grant which can be made available in each case in relation to the countervailing contributions from the industrial subscribers to associations, and as regards the eligibility for grant of types of organisation for collective research which, though not research associations in name, are in fact fulfilling similar purposes; financial provision should be made from public funds to enable the Department to increase and continue indefinitely financial support to research association and similar organisations as a permanent feature of the national economy." (para. 33).

The Report continues however: "At the same time, it would usually be undesirable" (for whom?) "for the Department to exercise any greater degree of control of the activities of the organisations which it supports by grant than is its present practice, since it is essential that the main responsibility regarding policy and programme, should continue to rest with the respective industries."

That is to say, public funds should be used to finance research for private enterprise. Furthermore, it is suggested that the D.S.I.R. could excercise an enhanced influence on research in industry and in the country generally, "if it were in a financial position to make grants . . . . for any research or developments of national importance. Such grants should be extended to cover capital expenditure and individual companies should be eligible for contributions where the research is of such a character as to have no commercial value to the firm concerned and would not therefore be prosecuted at its own charges." (para. 35).

No suggestion is made that the D.S.I.R. should be encouraged to spend more on nationally-owned and controlled research institutes for various industries, where the results of research would be publishable for the use of everybody and where it is more likely that the problems attacked would be of general importance to the inhabitants of this island, even though "of no commercial value." It is true that the report modestly suggests that "the dissemination of any resulting information would be at the sole discretion of the D.S.I.R." It is further recommended

that the D.S.I.R. should do more to develop research-mindedness by engaging a greater degree of publicity, through articles in the press, lectures and addresses.

THE TREATMENT OF THE RESEARCH WORKER.

The Report has a section (paras. 38-42) on the Scientist in Industry. It recommends that industry should make greater provision of funds for fellowship, bursaries, etc., at universities, technical schools and colleges for "junior personnel already in industry who show aptitude for a scientific career," and should place funds at the disposal of universities for post-graduate research. With regard to the "proper position of the research worker within the organisation employing him" the Report finds it "necessary to point out that the best results can be obtained from a firm's research personnel only if they are taken fully into the confidence of the management and given a definite standing in the hierachy of the organisation. The research worker cannot be expected to perform his duties unless he has at his disposal all relevant information which is in the possession of other branches of the organisation of which he is a member. It must be realised that the highly qualified pure scientist in general has had no opportunity of acquiring industrial experience and consequently cannot have that background for the strategic planning of the national research effort which is so necessary at the present time . . . . " (para. 39).

This is a very good point; but much depends on what is meant by the "*national* research effort." If this means only that a given firm or industry is, by applying research, to be better armed for post-war commercial rivalries, then we shall be once again involved in that competition which leads to war. Let every research worker have that wider vision for which the Report calls, but let it be a vision of producing economically and efficiently what the peoples need, and not only what is calculated to be the most profitable to sectional interests and private firms.

The Report points out (para. 40) that "publication of the scientific research aspects of his work is a legitimate ambition of every scientific worker" and that "experience has shown that such ambitions are not as a rule inconsistent with the interests of the firm engaged in competitive industry; on the contrary such publication increases the prestige of the firm concerned." Freedom of publication is a thing every scientific worker desires, but for the advancement of science and not only for the prestige of his firm.

There are other suggestions in the Report which are progressive and directed to making the application and development of research more efficient and effective. All this is good. But, running through the Report as a whole, the assumption is that if industry is made efficient to the highest peak by the application of science all will be well. The whole thing turns of course on what industry is to produce and for what end. If commercial profit is alone considered, we shall again land in the morass of violent commercial competition and over-production, leading again to economic slumps.

RESTRICTIVE MONOPOLIES

In their Policy the "120 Industrialists" argue in favour of large companies and combines on grounds of greater technical efficiency and the use of large financial resources in pursuing an active research and development policy. They say: "Industrial amalgamations are sometimes charged with abusing the strength of their position by retarding enterprise and invention, restricting production and either maintaining or raising prices unduly where price reductions are justified, thus exploiting the consumer instead of using their special efficiency to service him. We do not deny that this is theoretically possible, but it would however be checked by public opinion and in addition would seldom pay, for in these industries cheap production and profitable working depend on large output."

The danger is not however only "theoretically possible" but already exists and was developed in a particularly accentuated form before this war. The recent revelations of the Vice-President of the U.S.A., Mr. Henry Wallace, have stressed this. It will be recalled that Mr. Wallace accused certain organisations of American big business of having put commercial agreements with German firms before their obligations to their own Government. He cited specifically synthetic rubber (Butyl) which was "the subject of a private treaty between a great American oil company and I. G. Farbenindustrie, the German chemical colossus. These two great concerns made a deal. The Germans were given a world monopoly on synthetic rubber. The Americans were given a monopoly on synthetic gasoline.

This monopoly was good over the entire world, with the exception of Germany . . . . . This secret agreement between an American monopoly and a German cartel was submitted to no public authority in this country" (U S.A.). "It was far more important than most treaties, but it was never (seen) by the U.S. Senate. The peoples and the Governments of the world had unwittingly let the cartels and the monopolies form a super-government by means of which they could monopolise and divide whole fields of science and carve up the markets of the world at their own sweet pleasure . . . . ." "This super-government has misled the people of the U.S. not only with regard to rubber but in a host of other critical industries as well . . ." (Press reports 12-13th Sept., 1943.).

This is not a disease confined to the U.S.A. The recently published book *Germany's Master-Plan* (pub. John Long) by two officials of the Anti-Trust Department of the U.S.A. Department of Justice contains example after example of the ways in which large cartel and other organiations, cutting across national boundaries, in effect undermined the authority of states for the benefit of sectional commercial interests. It is here that the scientific worker must be a citizen, like any other worker; he cannot be content to consider only his immediate scientific interests but must, because of the enormous potential effects of his work, be concerned with their application.

IS BIG BUSINESS ALTRUISTIC?

The 120 Industrialists in their Policy of course adopt the role of progressive business men urging rationalisation and the concentration of capital in the interests of the consumer, the worker and the shareholders alike. They point to the technical efficiency that can be achieved with big concerns, and discuss, in a manner which to some may appear disarming, the mistakes of the past and even the possible dangers of dictatorial big industry inherent in their own proposals. They are obviously trying to create an atmosphere of trust and goodwill; they reiterate the altruistic nature of their intentions. History shows that big business is rarely altruistic, it depends for its existence on the ruthless extermination of competitors and on the exploitation of its employees. Big business knows that the mood of the people of Britain is not likely to tolerate lightly a return to the disgraceful pre-war situation of mass unemployment, of ruthless wage-cuts, of slumps, of drifting from war to war. These spokesmen of big business therefore are now most vocal in their proposals for social reform. Will they remain so?

It is inconceivable that the 120 Industrialists are unaware of the great achievements of Soviet Industry, yet they argue against nationalisation or State ownership of industry on the grounds that our present Civil Service is incapable of adaptation to become an efficient manager of or to give imaginative leadership to industry. That is true, but who has suggested that the present Civil Service should "run industry"?

A fundamental problem is set for scientific workers in these three documents. It is the choice between acquiescence in the ambitious schemes of the big monopolies, on the one hand, and conscious participation in the struggle to break their domination of the national life and economy, on the other. Scientists, even more than the average citizen, must by virtue of their vital technical knowledge, play an active part in this struggle. They must analyse with great care and penetration, the proposals of the leaders of big business, and must not be misled by liberal promises and assurances of good intention. They owe it to science and to the people of this country to do so. Science must not be allowed to become the technical handmaiden of monopoly to the detriment of the welfare of the people. Science must never be subordinated to greedy ambition, however carefully that ambition is disguised. In alliance with progressive social forces it can, as it has done before, transform the world. Which is it to be—science for reaction or science for progress, science for monopoly or science for the people?

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